2   About the 2010 Census TIGER/Line Shapefiles

2.1   What are the 2010 Census TIGER/Line Shapefiles?

The shapefiles represent geographic linear features such as roads, railroads, rivers, and non-visible legal boundaries; selected point features such as hospitals; and areal features such as parks as of January 1, 2010. The files also contain attribute information about these features, such as names, the type of feature, address ranges for most streets, the geographic relationship to other features, and other related information. The 2010 Redistricting Shapefiles include data for all 50 states, the District of Columbia and the Commonwealth of Puerto Rico.
The 2010 Census TIGER/Line Shapefiles contain 2010 Census geography and Census 2000 geography.

2.2   Geographic Features and Boundaries Available in the 2010 Census TIGER/Line Shapefiles

The 2010 Census TIGER/Line Shapefiles contain the geographic extent and boundaries of both *legal* and *statistical* entities. A legal entity is a geographic entity whose boundaries, name, origin, and area description result from charters, laws, treaties, or other administrative or governmental action. A statistical entity is any geographic entity or combination of entities identified and defined solely for the tabulation and presentation of data. Statistical entity boundaries are not legally defined and the entities have no governmental standing.

The legal entities included in these shapefiles are:

American Indian off-reservation trust lands
American Indian reservations (both federally and state-recognized)
American Indian tribal subdivisions (within legal American Indian areas)
Congressional districts
Counties and equivalent entities (except census areas in Alaska)
Hawaiian home lands
Incorporated places
Minor civil divisions (MCDs, legal county subdivisions)
School districts (elementary, secondary, and unified)
States and equivalent entities
State legislative districts (upper and lower chambers)
Subminor civil divisions (sub-MCDs, in Puerto Rico only)
Urban growth areas (in Oregon and Washington)
Voting districts

The statistical entities included in these shapefiles are:

American Indian/Alaska Native statistical areas
Alaska Native village statistical areas
Tribal designated statistical areas
Oklahoma tribal statistical areas
State designated tribal statistical areas
American Indian Tribal Subdivisions (within Oklahoma tribal statistical areas)
Block groups
Census areas (statistical county equivalents in Alaska)
Census blocks
Census county divisions (CCDs), census subareas (in Alaska), and unorganized territories (statistical county subdivisions)
Census designated places
Census tracts
Metropolitan and Micropolitan Statistical Areas and Related Statistical Areas
5-digit ZIP Code Tabulation Areas (ZCTAs)*

* will be released in summer 2011 supplemental release

2.3 New Features in the 2010 Census TIGER/Line Shapefiles

The 2010 Census TIGER/Line shapefiles include numerous feature updates and data corrections which were obtained during the 2010 Census field operations. Most notably, there have been extensive updates to the address ranges in the 50 States and the District of Columbia. The Census Bureau used the addresses and their locations collected during 2010 Census operations to update and build new potential address ranges. The results of these updates should improve address geocoding rates and quality.

2.4 Boundary Changes

The 2010 Census TIGER/Line Shapefile boundaries for some legal areas represent those that were collected as part of the Census Bureau's 2010 Boundary and Annexation Survey (BAS). The boundaries of all federally recognized American Indian Reservations and off-reservation trust lands, tribal subdivisions, states and equivalent entities, all counties and equivalent entities, all minor civil divisions (MCDs), all consolidated cities, and all incorporated places generally are those that were legally in effect as of January 1, 2010. Included in this vintage are legal changes to boundaries, such as annexations or deannexations of territory. 2010 Census TIGER/Line Shapefile boundaries for elementary, secondary, and unified school districts are collected through a survey of state school authorities under the auspices of the U.S. Department of Education's National Center for Education Statistics and are current as of the 2009-2010 school year.

Since the release of the Census 2000 versions of the TIGER/Line files, the Census Bureau has shifted and reshaped most linear features, including those that form legal or statistical area boundaries. The shape and area of the Census 2000 geographic entities portrayed in the 2010 Census TIGER/Line Shapefile may differ from their portrayal in the Census 2000 versions of the TIGER/Line files, but the inventory of Census 2000 tabulation entities remains the same.

For more information about the Boundary Annexation Survey (BAS), please visit:

http://www.census.gov/geo/www/bas/bashome.html

2.5 Spatial Accuracy of Linear Features

In order to maintain a current geographic database from which to extract the TIGER/Line Shapefiles, the Census Bureau uses various internal and external processes to update the MAF/TIGER database. While it has made a reasonable and systematic attempt to gather the most recent information available about the features this file portrays, the Census Bureau cautions users that the files are no more complete than the source documents used in their compilation, the vintage of those source documents, and the translation of the information on those source documents.

2.6 Initial Sources

The initial sources used to create the Census TIGER database, predecessor to the MAF/TIGER database, were the U.S. Geological Survey (USGS) 1:100,000-scale Digital Line Graph (DLG), USGS 1:24,000-scale quadrangles, the Census Bureau's 1980 geographic base files (GBF/DIME-Files), and a variety of miscellaneous maps for selected areas outside the contiguous 48 states. The DLG coverage is extensive, albeit of variable currency, and comprises most of the rural, small city, and suburban area of the TIGER/Line Shapefiles. GBF/DIME-File coverage areas were updated through 1987 with the manual translation of features from the most recent aerial photography available to the Census Bureau.

The Census Bureau added the enumerator updates compiled during the 1990 and Census 2000 census operations to the TIGER database. The updates came from map annotations made by enumerators as they attempted to locate living quarters by traversing every street feature in their assignment area. The Census Bureau digitized the enumerator updates directly into the TIGER database without geodetic controls or the use of aerial photography to confirm the features' locational accuracy.

The Census Bureau also made other corrections and updates to the Census TIGER database that was supplied by local participants in various Census Bureau programs. Local updates originated from map reviews by local government officials or their liaisons and local participants in Census Bureau programs. Maps were sent to participants for use in various census programs, and some maps were returned with

update annotations and corrections. The Census Bureau generally added the updates to the Census TIGER database without extensive checks. Changes made by local officials did not have geodetic control.

2.7   MAF/TIGER Accuracy Improvement Project

The Census Bureau began a multi-year project called the MAF/TIGER Accuracy Improvement Project (MTAIP) in 2002 to realign and update street features in our geographic database. The project realigned and updated the street features by county (or equivalent entity). The MTAIP was completed in 2008. State, tribal, county, and local governments submitted over 2,000 files, which the Census Bureau used as sources to perform the realignment and feature update work. In other counties, contractors performed the work using recently obtained imagery and/or driving the counties with Global Positioning System (GPS) enhanced mapping equipment. Though all counties have been through the process, additional realignment and corrections will continue to take place for some counties.

As part of this project, the Census Bureau used GPS coordinates at street centerline intersections to test and report the Circular Error 95 (CE95) horizontal spatial accuracy of source files obtained to: 1) realign street features in the MAF/TIGER database, and 2) test and report the horizontal spatial accuracy of the street features in the TIGER/Line Shapefiles. The test compared a survey-grade GPS coordinate to its associated street centerline intersection in the update source. The test was based upon an independent collection of GPS coordinates for a random sample of right-angle street intersections from a centerline file that meet certain criteria. The points were referred to as the sample points and were gathered through a private contractor. Since the collection method used survey-quality GPS-based field techniques, the resulting control points were considered "ground truth" against which the intersection coordinates were compared. The test verified that the spatial accuracy of the street network met the Census Bureau's horizontal spatial accuracy standard of CE95 at 7.6 meters (about twenty-five feet) or better. This accuracy standard requires that 95 percent of the time, the distance between the sample control points coordinates and their corresponding street centerline file intersection points not exceed 7.6 meters, i.e., a file point will fall within a radius of 7.6 meters of its corresponding control point.

The CE95 can be calculated from the mean and standard deviation by using the formula: mean of differences plus (2.65 times the standard deviation). The CE95 results reported for each file tested were determined using a spreadsheet with an embedded statistical formula. The use and applicability of the spreadsheet and its embedded formula were verified by Census Bureau statisticians. The basis of the calculation used the root mean square error (RMSE). This is the method as stated in the U.S. Government's Federal Geographic Data Committee Standard FGDC-STD-007.3-1998, Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy. The results of using this measure of accuracy are in compliance with Federal Spatial Data Accuracy requirements.
Address Canvassing

In preparation for the 2010 Census, Census employees walked virtually every street in the United States and Puerto Rico with the primary purpose of verifying and updating Census address lists. A second priority was to provide updates to the Census road network. For the first time census workers used handheld computers that captured GPS information and used this technology to improve both the address lists and the census road network. Census field workers had the opportunity to use GPS to add new roads, identify roads for deletion, and rename existing roads. These modifications should be reflected in the 2010 Census TIGER/Line Shapefiles.

2.8   Coordinates

Coordinates in the TIGER/Line Shapefiles have six decimal places, but the positional accuracy of these coordinates may not be as great as the six decimal places suggest. The spatial accuracy varies with the source materials used. In areas where the Census Bureau has not realigned street features as part of MTAIP it meets, at best, the established National Map Accuracy standards (approximately + /− 50 meters or 167 feet) where 1:100,000-scale maps from the USGS were the source. The Census Bureau cannot specify the spatial accuracy of feature changes added by its field staff or local updates or of features derived from the GBF/DIME-Files or other map or digital sources. Thus, the level of spatial accuracy in the TIGER/Line Shapefiles may not be suitable for high-precision measurement applications such as engineering problems, property transfers, or other uses that might require highly accurate measurements of the earth's surface. No warranty, expressed or implied, is made with regard to the accuracy of these data, and no liability is assumed by the U.S. Government in general or the Census Bureau specifically, as to the spatial or attributes accuracy of the data.

2.9   Codes for Geographic Entities

The Census Bureau is currently transitioning from the Federal Information Processing Standards (FIPS) codes issued by the National Institute of Standards and Technology (NIST) to codes issued by the American National Standards Institute (ANSI). In 2005, the NIST publications that define FIPS codes for entities were withdrawn. Many of the former FIPS codes are being reissued, virtually unchanged, by the ANSI.

The Census Bureau, citing thirty years of common use, will continue to refer to many of the codes it publishes as FIPS codes with FIPS referring to Federal Information Processing Series. These codes appear in the TIGER/Line Shapefiles in fields such as "STATEFP", where "FP" indicates that the field contains a FIPS code. FIPS codes will continue to serve as the key matching and joining codes, where appropriate, for Census Bureau products.

The United States Geological Survey's Geographic Names Information System (GNIS) feature identifier has also been issued as a code standard by the American National Standards Institute. This is a permanent numeric identifier of up to eight digits. The TIGER/Line Shapefiles refers to these eight-character numeric codes as National Standard ANSI codes, and they appear in the files in fields such as "STATENS", where "NS" (for National Standard) indicates that the field contains this type of code. The TIGER/Line documentation also refers to these codes as the ANSI code. The Census Bureau stores the ANSI code as a fixed-width string; the official code is a numeric value without leading zeroes. The ANSI code is only available for 2010 vintage entities.

For more information about the FIPS to ANSI transition, please see
http://www.census.gov/geo/www/ansi/ansi.html.